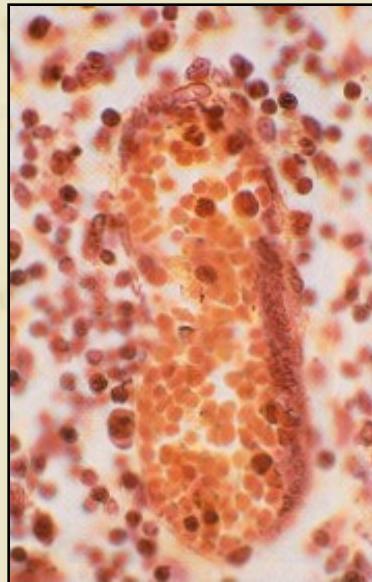




Medical NBC Briefing Series

Medical NBC Aspects of Pneumonic Plague





Purpose

- *This presentation is part of a series developed by the Medical NBC Staff at The U.S. Army Office of The Surgeon General.*
- *The information presented addresses medical issues, both operational and clinical, of various NBC agents.*
- *These presentations were developed for the medical NBC officer to use in briefing either medical or maneuver commanders.*
- *Information in the presentations includes physical data of the agent, signs and symptoms, means of dispersion, treatment for the agent, medical resources required, issues about investigational new drugs or vaccines, and epidemiology.*
- *Notes page*



Office of the Surgeon General
for the Army



Outline

- **Background**
- **Battlefield Response**
- **Medical Response**
- **Command and Control**
- **Summary**
- **References**





Background

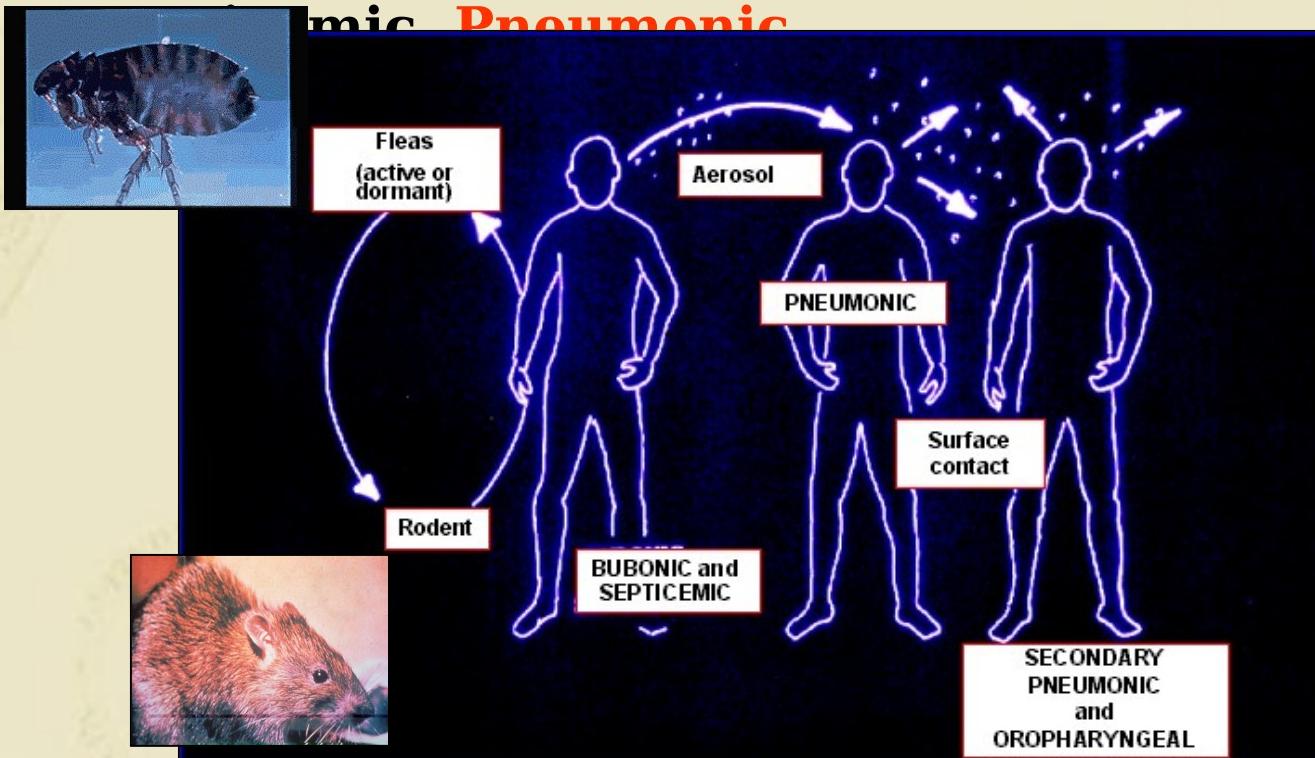
- Disease Background
- General Background
- Pneumonic Plague
Disease Course
Summary
- Signs and Symptoms
- Diagnosis
- Treatment
- Current Situation
- Weaponization





Disease Background

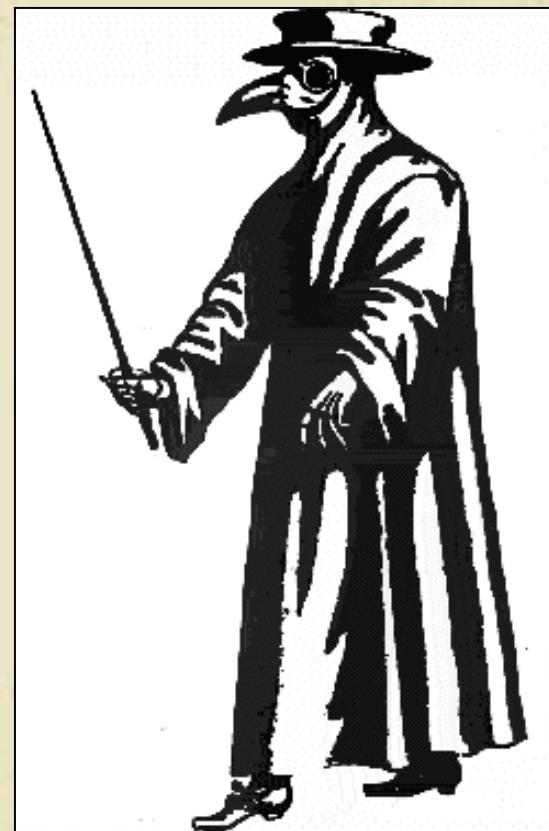
- **Bacteria:** *Yersinia pestis*
- **Vector:** flea (*Xenopsylla cheopis*)
- **Three forms of Plague:** Bubonic, Primary Pneumonic, Secondary Pneumonic and Oropharyngeal





History

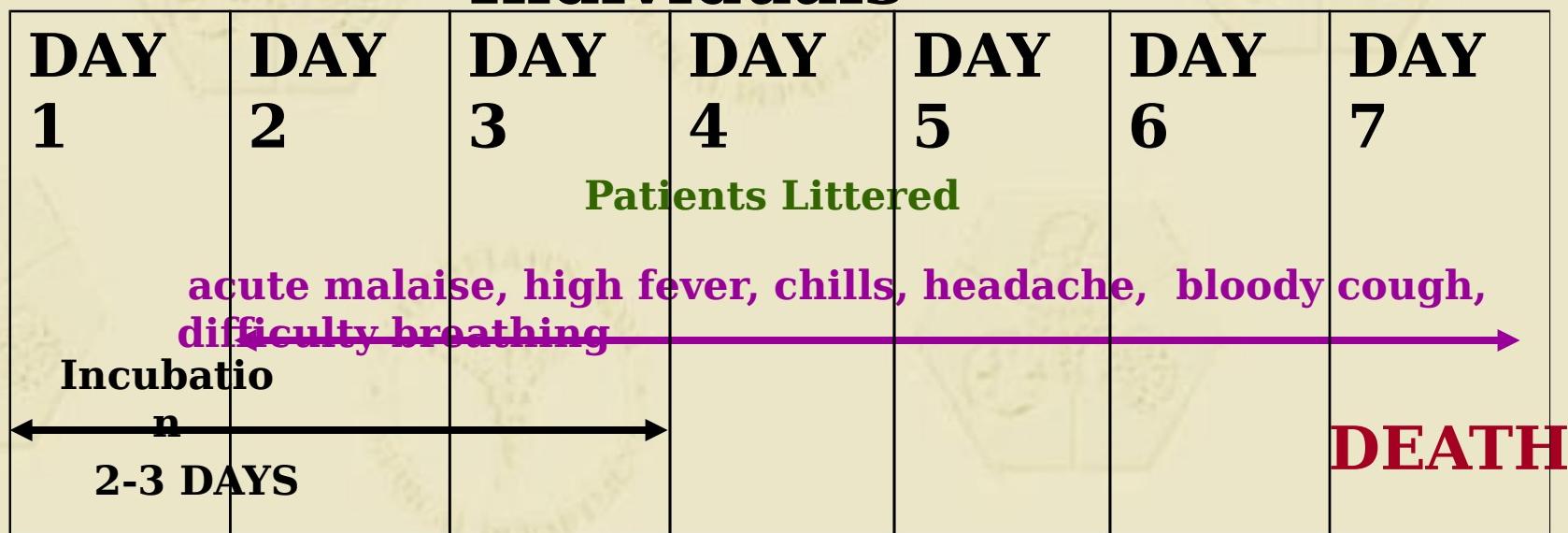
- Ancient - first cited in I Samuel V:6,9 - 1320 BC
- Major Pandemics
 - 541 AD - Plague of Justinian
 - 1346 AD - 'Black Death'
 - 1894 AD - Modern Pandemic
- 200,000,000 deaths have been attributed to plague
- Pneumonic plague has rarely been the dominant manifestation





Pneumonic Plague Disease

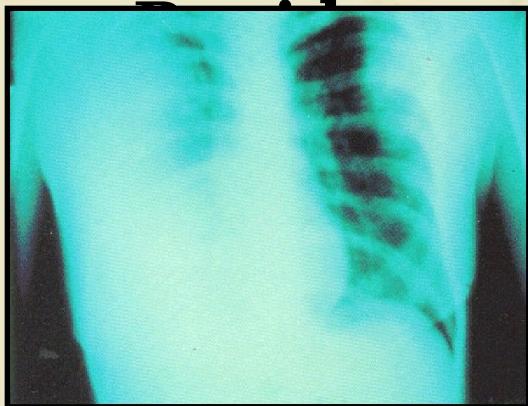
Course Summary In Untreated Individuals



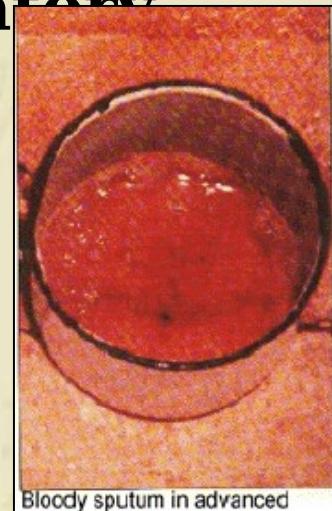
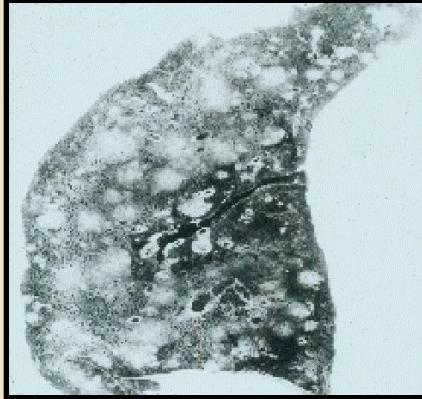


Signs and Symptoms

- 2 to 3 day incubation period
- High fever, chills, headache, and cough with bloody sputum
- Development of severe difficulty breathing and eventual circulatory collapse



Disease presentation of

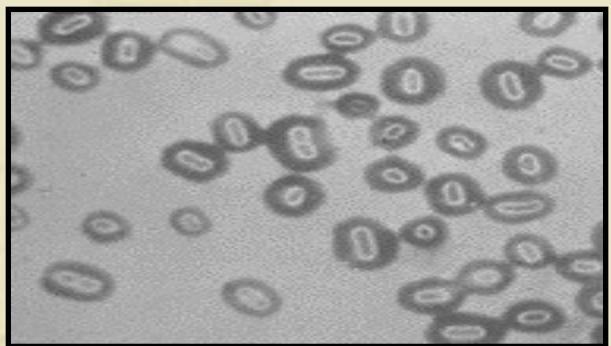
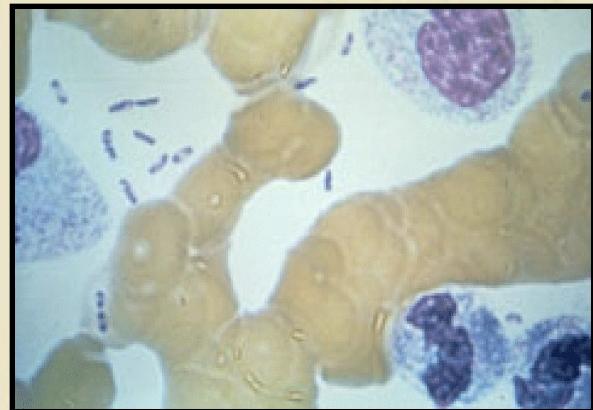


Bloody sputum in advanced pneumonic plague



Laboratory Diagnosis

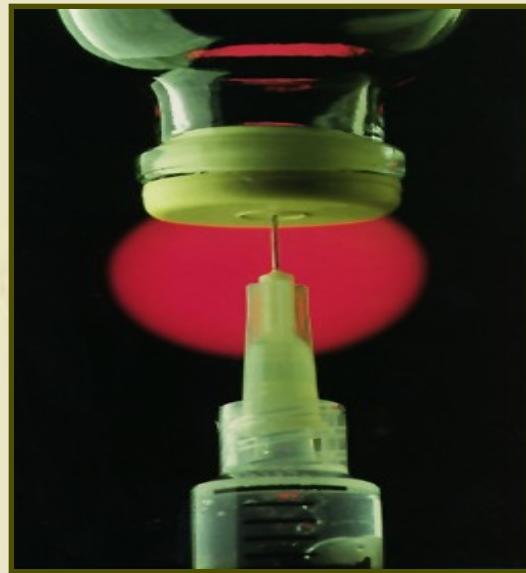
- **Cultures from blood and sputum**
- **Requires a minimum BL-2 laboratory with respiratory isolation protection**
- **Handling specimens should be with glove and mask precautions**





Treatment - Prophylaxis

- **Plague vaccine**
 - 3 doses:
 - Initial dose
 - 1 month
 - 6 months
- **Efficacy against aerosolized *Y. pestis* has not been established**





Treatment - Clinical

- **Early recognition and treatment is paramount**
 - Fatality rate of treatment delayed more than 24 hours after onset of symptoms if high
- **Quarantine of known cases for at least 48 hours**
- **Supportive care - substantial advanced medical supportive care is necessary**
 - Oxygen
 - Hydration (IV therapy)
 - Ventilation support for severe cases
 - Support for possible multi-organ failure





Treatment - Clinical (cont.)

- **Antibiotic therapy - Bubonic or Pneumonic**
 - Gentamicin - 5 mg/kg I.V. q 24 hr X 10 days
 - Streptomycin (age-old favorite) - 15 mg/kg I.M. bid X 10 days
 - Sulfadiazine 2-3 gm days
 - Chloramphenicol





Current Situation

Worldwide Cases

- 1980 - 89 861 / year 11% mortality
- 1990 - 94 1974 / year 8%
mortality



The shaded areas show natural plague foci (in rodent populations).

Small percentage of pneumonic patients.



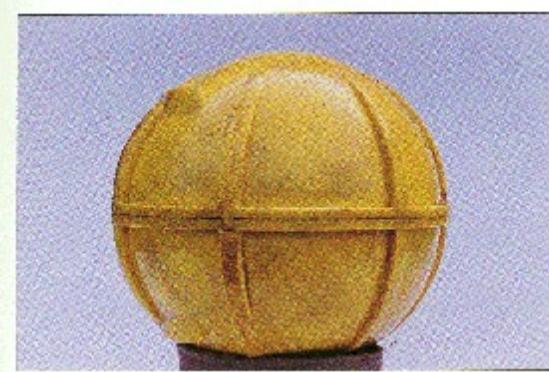
Weaponization

- As a biological warfare agent, *Y. pestis* poses a significant threat to ground troops
 - Highly transmissible
 - Infectious
 - Lethal
- Easily dispersible to ground troops and vector animals in theater
- May remain viable in 68 % humidity for up to 2 days

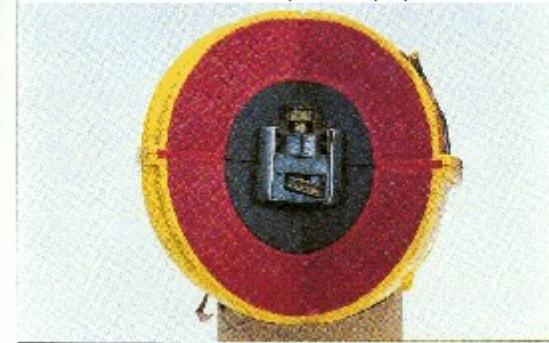


Weaponization (cont.)

- **Operation Cauldron:** U.S. offensive program - 1952
- **Soviet program**
- **Aerosolization**
 - Inhalation threat
 - Delivery systems can be simple
 - Spray systems
 - Sub munitions
 - Detonation containers
 - Crop duster or boat
 - Bomblets
 - Aircraft



M143 Biological bomb - used for anti-crop, anti-animal, or anti-personnel purposes.





Battlefield Response to Plague

- **Detect**
- **Protect**
 - Individual protection
 - Collective protection





Detection

- **Possible methods of detection**
 - Detection of agent in the environment
 - Clinical (differential diagnosis)
 - Medical surveillance (coordination enhances detection capability)
- **Diagnosis of plague is not presumptive of a BW attack - plague may be endemic to the area**



Detection of Agent in the Environment

- Biological Smart Tickets
- Enzyme Linked Immunosorbant Assay (ELISA) (Fielded with the 520th TAML)
- Polymerase Chain Reaction (PCR) (Fielded with the 520th TAML)





Detection of Agent in the Environment (cont.)

- **M31E1 Biological Integrated Detection System (BIDS)**
- **Interim Biological Agent Detector (IBAD)**





Clinical Detection

Sudden presentation of

- Respiratory syndromes with a bloody cough, high fevers, chills, and headaches presenting in groups

Possible causative agents:





Clinical Detection Laboratory Confirmation

- Division medical assets lack lab equipment to conduct test to determine plague
- Specimen must be sent to theater level or CONUS lab
- Lab specimens should be submitted to the correct diagnostic laboratory
 - Responsibility of the Lab Officer
 - Ensure the chain of command is aware of the situation
- Contact lab prior to collection or



Clinical Detection Laboratory

Confirmation (cont.)

Points of contact for biological sampling and shipping

- Corps Chemical Of
- Technical Escort U
- AFMIC
- 520th TAML
- USAMRIID
- WRAIR
- CDC





Detection Medical Surveillance

MARYLAND ARMY NATIONAL GUARD
DISCOM 29th Infantry Division (Light)
DIVISION MEDICAL OPERATION CENTER (DMOC)

Patient Summary Report
29th INF (L) DIV

From: Division Medical Operations Center (DMOC)
To: Division Surgeon

Date Time Group: From: 121200RJUN99
To: 202400RJUN99

PATIENTS

Nation	WIA	NBI	Disease	Neuropsychiatric Stress-Related	Total
US	0	97	55	0	152
Allied	0	0	0	0	0
EPW	0	0	0	0	0

DISPOSITION

Action	Count
Return to duty	148
Holding in Division's MTFs	0
Evacuated and returned	3
Evacuated by air	0
Evacuated on ground	1
Expired en route	0
Expired in MTF	0

Clues in the daily medical disposition reports

- High numbers of high fevers, chills, headache, and respiratory syndromes with a bloody cough
- Rapid identification and reporting of pneumonic



Protect Individual Protection

- **Mask and BDO with gloves and boots.**
- **Standard uniform clothing affords a reasonable protection against dermal exposure to biological agents**
- **Casualties unable to wear MOPP should be handled in casualty wraps**





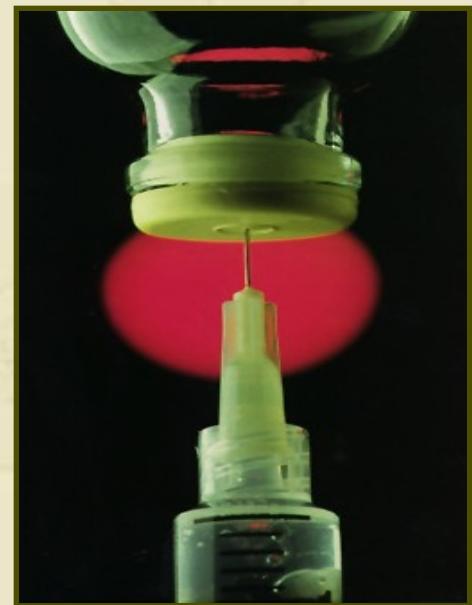
Protect Collective Protection

- Hardened or unhardened shelter equipped with an air filtration unit providing overpressure
- Standard universal precautions should be employed as individuals are brought inside the collective protection units
- Pneumonic plague is communicable from person to person
- Contaminated articles can be decontaminated using 0.05% hypochlorite solution (1 tbps. bleach per gallon of



Protect Vaccinations

- Plague vaccine
- Efficacy against aerosolized *Y. pestis* has not been established





Medical Response to Pneumonic Plague

- Triage and Evacuation
- Infection Control
- Resource Requirements





Triage and Evacuation

- **Triage**

- Priorities based on severity of symptoms
- Respiratory support, ICU needs and quarantine facilities will increase priorities

- **Evacuation -Immediate**

- Standard evacuation assets may be used
- Observe standard respiratory infection control precautions during evacuation
- Evacuation of patients will be





Evacuation or Quarantine

• Evacuation

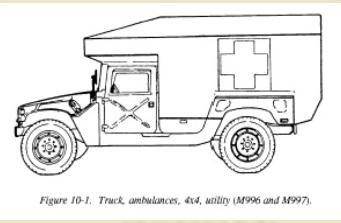
- Plague patients not likely to RTD in the normal theater evacuation policy of 15 days
- Strict interpretation of the doctrine calls for evacuation

• Quarantine

- Contagious
- Limit spread of the bacteria
- Unlike smallpox, plague is already endemic to various parts of the world

• Guidance

- Before evacuating patients suspected of plague, seek guidance from CINC





Infection Control

- Pneumonic plague is communicable from person to person
- Mass immunization
- Doxycycline for patient contacts and exposed individuals
- Respiratory and body fluid precautions apply for patient contact
- Patient isolation
- Personnel and article





Resource Requirements

- **Evacuation Assets**
- **Supportive therapies**
 - IV antibiotics
 - Hemodynamic monitoring
- **Intensive care facilities for severe cases**
- **Isolation areas for infected individuals**
- **Quarantine, if imposed, would strain the supply chains**





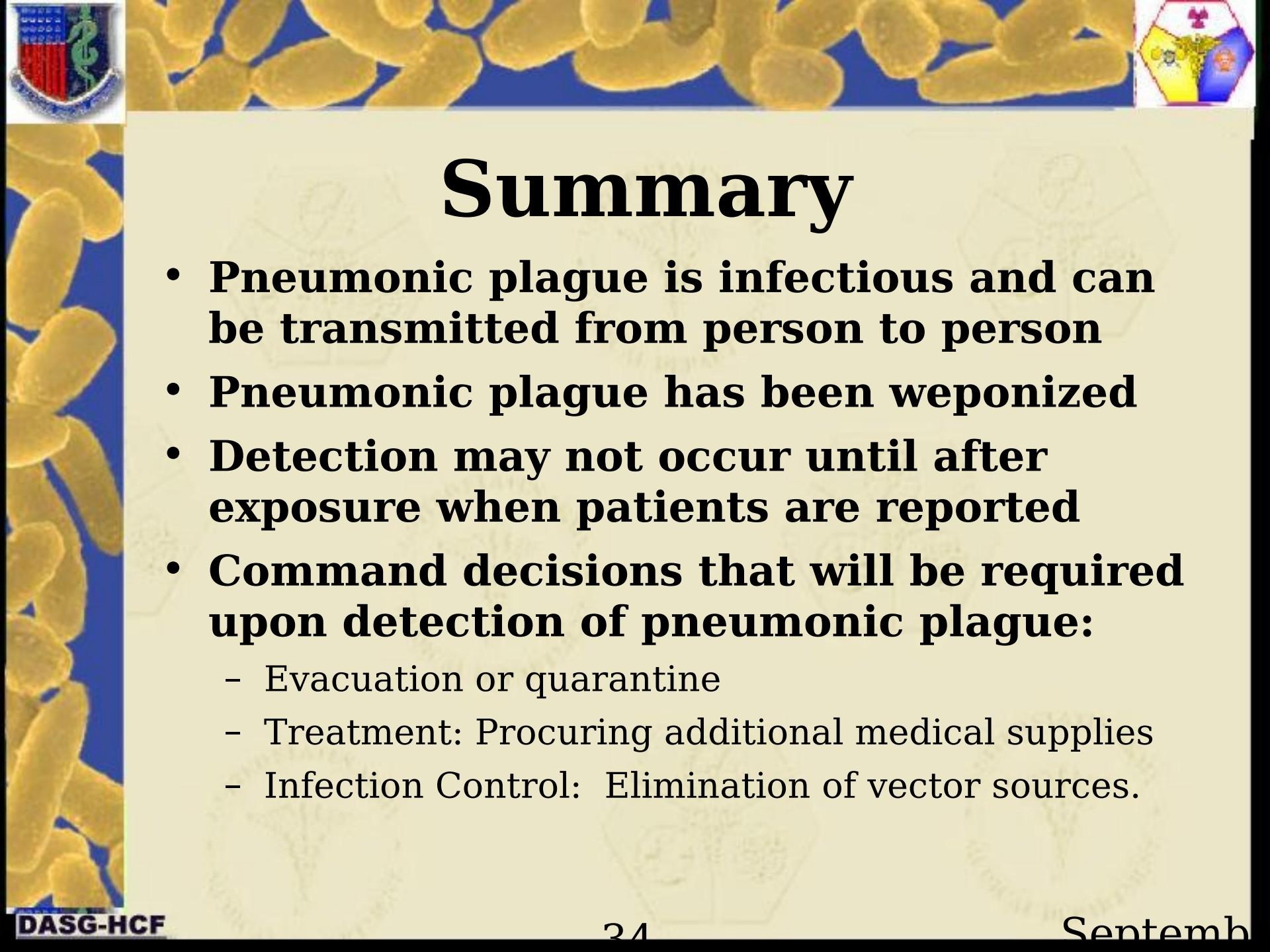
Command and Control

- **Intelligence**
 - Medical surveillance and intelligence reports are key to keep the Command alert to the situation
- **Evacuation of the sick or Quarantine**
- **Maneuver**
 - Quarantine or isolation is required for symptomatic patients
- **Logistics**
 - Additional Class VIII materials will be required and evacuation routes to Echelon III will be heavily utilized
- **Manpower**
 - Numerous soldiers may be affected by aerosol



Command and Control Response to Psychological Impact

- May vary from person to person
- Psychological Operations
 - Rumors, panic, misinformation
 - Soldiers may isolate themselves in fear of disease spread
- Countermeasures
 - LEADERSHIP is responsible for countering psychological impacts through education and training of the soldiers
 - Implementation of defensive measures such as crisis stress management teams



Summary

- **Pneumonic plague is infectious and can be transmitted from person to person**
- **Pneumonic plague has been weaponized**
- **Detection may not occur until after exposure when patients are reported**
- **Command decisions that will be required upon detection of pneumonic plague:**
 - Evacuation or quarantine
 - Treatment: Procuring additional medical supplies
 - Infection Control: Elimination of vector sources.



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